Impact of African–American race on presentation, treatment, and survival of head and neck cancer

Brandon A. Mahal [a,1], Gino Inverso [b,1], Ayal A. Aizer [c], R. Bruce Donoff [b,d], Sung-Kiang Chuang [b,d,*]

[a] Harvard Medical School, 25 Shattuck St., Boston, MA 02115, USA
[b] Harvard School of Dental Medicine, 188 Longwood Ave., Boston, MA 02115, USA
[c] Harvard Radiation Oncology Program, Massachusetts General Hospital, 55 Fruit Street, Boston, MA 02114, USA
[d] Department of Oral and Maxillofacial Surgery, Massachusetts General Hospital, 55 Fruit Street, Boston, MA 02114, USA

A R T I C L E   I N F O

S U M M A R Y

Objectives: To determine the associations between African American race and stage at diagnosis, receipt of definitive therapy, and cancer-specific mortality among patients with head and neck cancer.
Materials and methods: The Surveillance, Epidemiology and End Results (SEER) database was used to conduct a retrospective study on 34,437 patients diagnosed with head and neck cancer from 2007 to 2010. Multivariable logistic regression analyses were applied to determine the impact of race on cancer stage at presentation (metastatic vs. non-metastatic) and receipt of definitive treatment. Fine and Gray competing-risks regression modeled the association between race and head and neck cancer-specific mortality.
Results: African Americans were more likely to present with metastatic cancer compared to non-African Americans (Adjusted Odds Ratio [AOR] 1.76; CI 1.50–2.07; $P < 0.001$). Among patients with non-metastatic disease, African Americans were less likely to receive definitive treatment (AOR 0.63; CI 0.55–0.72; $P < 0.001$). After a median follow-up of 19 months, African Americans with non-metastatic disease were found to have a higher risk of head and neck cancer specific mortality (AHR 1.19; 95% CI 1.09–1.29; $P < 0.001$).
Conclusion: African Americans with head and neck cancer are more likely to present with metastatic disease, less likely to be treated definitively, and are more likely to die from head and neck cancer. The unacceptably high rates of disparity found in this study should serve as immediate targets for urgent healthcare policy intervention.

Introduction

There are an estimated 42,440 new cases of oral and pharyngeal cancer diagnosed each year and 8390 deaths annually [1]. The 5-year survival rate for all patients diagnosed with oral and pharyngeal cancer is 64% [1]. When stratified by race, the 5-year survival rate for African Americans drops to 43%. Although there are currently no practical head and neck cancer (HNC) screening or detection strategies in place, cure rates approximate 50% and can reach 90% with early stage detection [2,3]. Still most patients present with advanced stage disease [1].

Previous studies in HNC outcomes research have demonstrated that African American patients face an unequal burden of disease due to differences in socioeconomic status, limited access to care, advanced cancer stage, lower receipt of treatment, and comorbidity [4–7]. Nevertheless, the existing literature focusing on racial disparities in HNC outcomes have not been able to account for relevant sociodemographic factors such as insurance, which has been suggested to have a significant impact on cancer outcomes and treatment patterns [2,8,9]. Additionally, the majority of existing studies do not utilize cancer specific mortality as an endpoint and are unable to account for comorbid disease that has been shown to disproportionally contribute to the mortality of African American patients with HNC [7]. Lastly, previous studies focusing on racial disparities in HNC outcomes have examined smaller cohorts restricted to few sites, thus limiting the number of pertinent covariates that could be adjusted for and generalized conclusions that could be made about disparities in HNC [8–11].

The Surveillance, Epidemiology and End Results Program (SEER) program, sponsored by the National Cancer Institute, collects incidence, prevalence, survival and mortality on cancer [12]. The SEER

* Corresponding author at: Harvard School of Dental Medicine, 188 Longwood Ave, Boston, MA 02115, USA. Tel.: +1 617 432 1434; fax: +1 617 432 1897.
  E-mail address: sung-kiang_chuang@hms.harvard.edu (S.-K. Chuang).
[1] Authors had equal 1st author contribution.

program captures approximately 97% of incident cancers and the 17 tumor registries encompass approximately 26% of the US population. Additionally, the database provides valuable demographic information, such as county level income level and educational status, residence type, and as of 2007, individual level data on insurance status. The main objective of this study is to utilize the SEER database to examine the associations between African American race and stage at diagnosis, receipt of definitive therapy, and cancer-specific mortality among patients with HNC utilizing robust multivariable models adjusting for the potentially pertinent sociodemographic covariates mentioned above.

Material and methods

Study population

The SEER database was utilized to identify 34,437 patients (3820 African American and 30,617 non-African American) diagnosed with HNC from 2007 to 2010. The inclusion period was limited to 2007–2010, as 2007 represents the year data on insurance status was introduced and 2010 represents the most recent year that full patient information was made available.

Study variables

The primary covariate of interest was African American race as designated by the SEER database. Other races (non-African American) were classified as non-Hispanic white, non-black Spanish/Hispanic/Latino, Asian or Pacific Islander, Native American, and other as provided by the SEER dataset.

The outcomes of interest were cancer stage at presentation (metastatic vs. non-metastatic), receipt of definitive treatment, and cancer-specific mortality. Other-cause mortality (non-HNC) was used as a proxy to adjust for the effect co-morbidity may have had on receipt of definitive treatment. Metastases were recorded according to the TNM system as defined by the American Joint Committee on Cancer Staging (AJCCS) Manual (6e) [13]. Definitive treatment included surgery, radiation, or combination of surgery and radiation in accordance with the National Comprehensive Cancer Network (NCCN) guidelines for Head and Neck Cancers [14]. Information on chemotherapy is not provided by SEER. Cancer-specific mortality was designated according the SEER dataset.

Other variables

Age at diagnosis and sex were determined as provided by the SEER database. Income was calculated as median household income, while level of education was categorized as percent of residents $\geqslant 25$ years of age with at least a high school diploma; both were determined at the county level by linking to the 2000 United States Census. Residence type was also determined at the county level by linking to the 2003 United States Department of Agriculture rural-urban continuum codes [15]. Insurance status was determined at the patient-level and analyzed as a bivariate value (insured vs. uninsured). Based on the SEER defined tumor sites, HNC was comprised of five sites: Oral cavity, oropharynx, hypopharynx, nasopharynx, and larynx. Tumor stage (according to the TNM system, AJCCS) and grade were determined as provided in the SEER dataset [13].

Statistical analysis

Cohort characteristic information was analyzed using the independent samples t-test, χ^2 test, and Fisher exact test, as appropriate. After adjusting for patient demographics (age at diag-

nosis, sex, marital status) and socioeconomic factors (income, level of education, residence type, and insurance status), multivariable logistic regression analysis was applied to measure the effect African American race had on metastatic vs. localized presentation. Multivariable logistic regression was also used to determine whether there was an association between race and receipt of definitive treatment vs. not for patients with non-metastatic disease, after adjusting for patient demographics (as listed above), socioeconomic factors (as listed above), and tumor characteristics (tumor site, T stage, and grade) [16]. Logistic regression analyses were repeated, site by site.

Fine and Gray competing risks regression was then used to model the impact of African American race on mortality due to HNC among patients with non-metastatic disease, after adjusting for the previously listed variables in addition to receipt of definitive therapy [17]. Competing risks regression was repeated site by site. Cumulative incidences of cancer-specific mortality stratified by race (African American vs. non-African American) were generated from the competing-risks regression models described above and displayed graphically [18]. Point estimates and associated confidence intervals (CI) were generated and compared using Gray k-mean P value.

All P values were two-sided. A P value $\leqslant 0.05$ was considered statistically significant. Statistical analyses were performed using STATA 13.0 (StataCorp, College Station, TX) for all analyses. This study was approved by the institutional review board at our institution; a waiver for informed consent was obtained.

Results

Cohort characteristics

Among the study cohort of 34,437 patients, 3820 patients (11.1%) African American and 30,617 (88.9%) were non-African American. Overall, African American patients lived in areas with lower median household incomes, had lower levels of education, were less likely to be insured, and presented with more advanced stage and grade of HNC in comparison to non-African Americans ($P < 0.001$ for all characteristics) (Table 1).

Impact of race on head and neck cancer stage and treatment

In comparison to 3.3% of non-African American patients, 5.9% of African American patients presented with metastatic cancer ($P < 0.001$). Furthermore, after adjusting for patient demographics and socioeconomic factors, multivariable logistic regression analysis revealed that African American patients were significantly more likely to present with metastatic HNC compared to non-African American patients (Adjusted Odds Ratio [AOR] 1.76; 95% CI 1.50–2.07; $P < 0.001$). When stratified by site, African American patients had significantly increased odds for metastatic cancer of the oral cavity and oropharynx (AOR 2.20 and 1.93, respectively) (Table 2).

After adjusting for tumor characteristics in addition to patient demographics and socioeconomic factors, African American patients with non-metastatic disease were significantly less likely to receive definitive treatment in comparison to non-African American patients (AOR 0.63; 95% CI 0.55–0.72; $P < 0.001$). When stratified by site, African American patients had decreased odds of receipt of definitive treatment for cancer of the oral cavity, hypopharynx, nasopharynx, and larynx (AOR 0.73, 0.49, 0.55, and 0.67, respectively). After utilizing other-cause mortality (non-HNC death) as a proxy for co-morbidity in the multivariable logistic regression, the odds ratio for receipt of treatment for African American patients did not change (AOR 0.62; 95% CI 0.53–0.73; $P < 0.001$) (see Table 3).